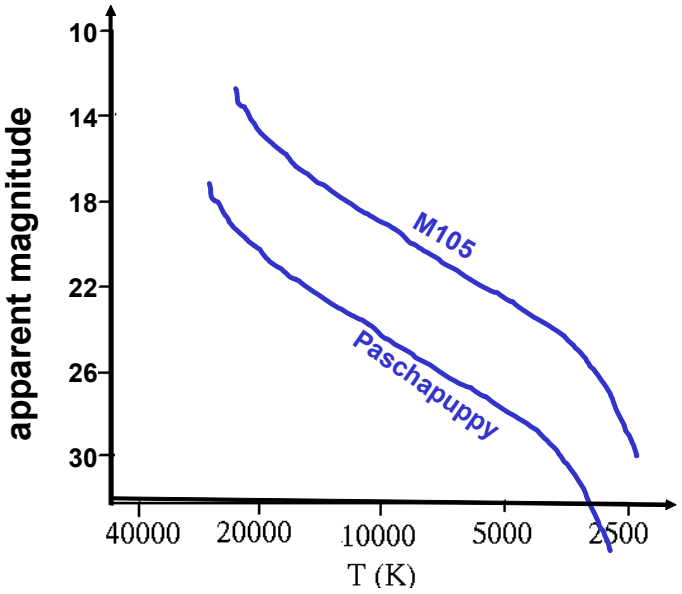
Natural Sciences 102 -- Spring 2004

Homework #7 May 11, 2004
Due in class May 18 2004

1. The H-R Diagram as a distance indicator:

a) Describe in words (you may use equations if you wish) how the H-R diagram can be used as a distance indicator.
b) The distance to the open cluster M105 is known to be 1000 pc. Another cluster is discovered by Vasileios Paschalidis, which he names the Paschapuppy cluster. Use the information from the H-R diagrams below to calculate the distance to Paschapuppy.



2. Hubble's Law: (Please show your work.)

The spectrum of the light from the galaxy Anibal has a line at 5500 Angstroms. The line is from the element seinium, and in the laboratory the wavelength is 5000 Angstroms.

1. What is the apparent recessional velocity of Anibal.
2. Using a Hubble constant of $H_0 = 50$ km s^{-1} Mpc^{-1} and the fact that the velocity of light is $c = 3\times10^5$ km s^{-1}, what is the distance to Anibal?

(over)

3. **Doppler Shift:**

   a) Define the Doppler shift and explain how it can be used to determine velocity.
   b) Justin Johnsen is driving his new pickup truck through the streets of his hometown of Jockitch, Texas. Sheriff Catchem points his radar gun at Justin's bright red pickup and determines that the radar beam of wavelength 10 meters he sent out bounced off the gunrack in his truck and returned to him with a wavelength of 10.000001 meters.
      1. Is Justin approaching Sheriff Catchem or driving away from him?
      2. How fast is Justin driving?

News of the week

- The class website is still http://home.fnal.gov/~rocky/natsci102/ .
- This week's laboratory will be the second week of "Geometry of the Universe."
- May's reading assignment is Kolb, Chapters 6-11; Hogan, the entire book.
- It would be a good idea to start Hawking.